

AWS-3: Lab Testing, Simulations, and a Path Forward

September 16, 2008

Overview

- T-Mobile is Making Wireless Broadband a Reality
- Testing at Boeing Facility with FCC and Other Parties
 - Lab tests demonstrated serious interference to AWS-1
 - Testing debunks M2Z's filter myth
- Optimi's Monte Carlo Simulations (aka Probability Analysis)
 - When appropriate assumptions are used, the statistical (Monte Carlo) model demonstrates high likelihood of interference – contrary to M2Z's assertions
- Serious Legal and Policy Flaws in Proposal
 - Interference will impede availability of real wireless broadband
 - No notice of intent to impose interference on AWS-1
 - “Free broadband” is neither free nor broadband
- A Path Forward
 - Asymmetrical pairing of AWS-3 with J Block
 - Enables new entrant and others to bid

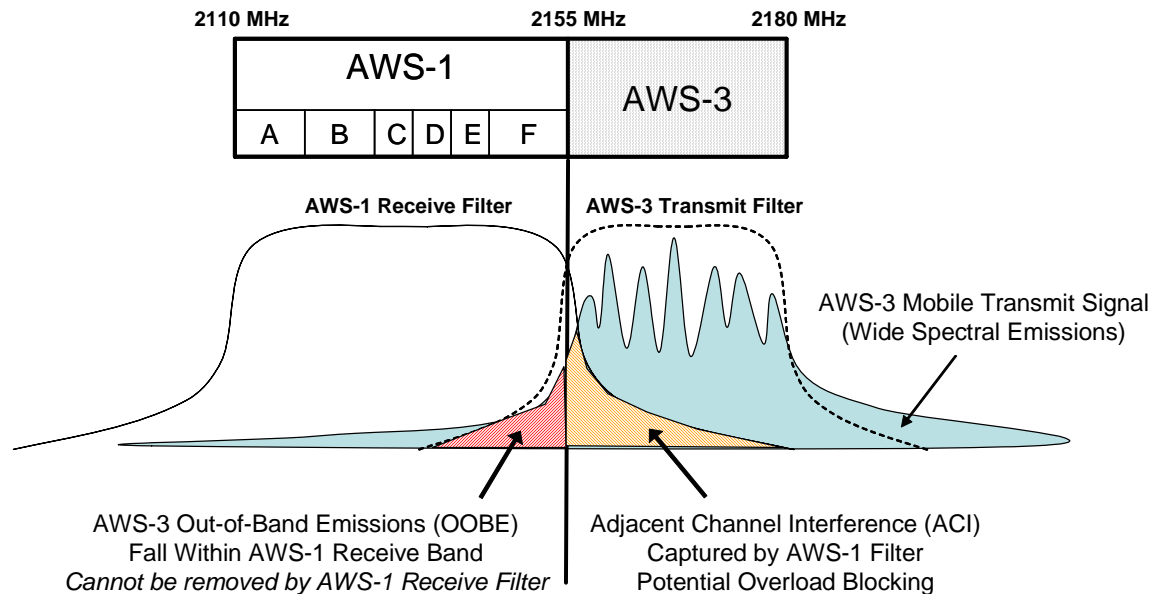
T-Mobile is Making Wireless Broadband a Reality

- Rapidly rolling out 3G service in AWS-1
- Launched in major markets (e.g., Houston, New York City, Minneapolis, Austin/San Antonio, Baltimore, Dallas, Las Vegas, New Jersey, Long Island, Boston, Providence and Phoenix) and will deploy in the top 25 markets in the U.S. in 4Q08
- 3G rollout in AWS-1 vital for competition and consumers

Tests Confirm Interference Concerns

- Under the FCC's proposed rules, AWS-1 operations will suffer harmful interference due to OOB and receiver overload/blocking
- T-Mobile's AWS-1 customers would be unable to communicate within a large radius around an AWS-3 device transmitting at even moderate power levels
- Debilitating impacts include call set-up failures, degraded speech quality, degraded data throughput and dropped calls – all evidence of serious quality and reliability degradation
- The interference would be a high probability event, occurring in many common situations
- The wireless industry – other than M2Z – concur
 - AT&T, CTIA, MetroPCS, Motorola, Nokia, Sony Ericsson, 3G Americas, Qualcomm, VZW

Handset “Filters” Will Not Cure Interference



- Tests prove that the FCC's proposal would allow AWS-3 mobiles to create “out-of-band” interference to AWS-1 mobiles
- “Out-of-band” emissions from an AWS-3 mobile device are “in-band” as far as the AWS-1 device is concerned (red shaded area above), making significant portions of AWS-1 spectrum unusable

Accurate Simulation *Confirms* Test Results

- Statistical analyses presented by M2Z did not incorporate many of the characteristics of real networks, such as uneven distribution of traffic (*e.g.*, hotspots and busy hours) and indoor use
- When these are factored in, simulation demonstrates widespread and persistent call failures due to interference from AWS-3 devices
- Around one-fifth of cell sectors suffered capacity degradation worse than 10% due to AWS-3 interference
 - Home users experiencing 10.6% capacity loss
- Users with an AWS-3 router inside their homes had a 67% chance of lost calls when there was simultaneous AWS-3 transmission
- Users that had a neighbor with an AWS-3 router had a 28% chance of lost calls when the AWS-3 router was transmitting

Serious Legal and Policy Flaws Remain

- AWS-1 licensees were never put on notice of potential interference from AWS-3
 - Contrary to M2Z's claims, it was the proponents of mobile operations in the AWS-3 band who were put on notice that they must "conclusively demonstrate that portions of this spectrum could be used for [TDD] transmissions without causing interference to ... other licensees."
- Demonstrated likely and debilitating interference to AWS-1 will cripple real wireless broadband competition just as it's getting started
- M2Z "free broadband" is not free and not broadband
 - Requires purchase of "not for free" PC and network device
 - By 2013, 768 Kbps will be the equivalent of dial-up service
- 56 companies concerned about impact of government subsidized "free service"
 - Opening spectrum to other options better promotes competition and broadband deployment overall

Path Forward: Asymmetrical Pairing of AWS-3 Spectrum Is a Reasonable Alternative

- Asymmetrical pairing of AWS-3 downlink with J Block
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- The AWS-3 downlink could be paired with J Block uplink/downlink
 - Standards bodies have confirmed feasibility of asymmetrical pairing
 - Eliminates TDD adjacent to AWS-1 FDD, along with associated interference
 - Facilitates bi-directional use of the new bands
 - Allows new entrants, including M2Z, to bid

Conclusions

- Lab tests performed in an open forum
 - Tests evaluated interference at specification levels proposed in FCC FNPRM
 - Assessed Out-of-Band Emissions and Receiver Overload Interference
 - Performed with and without external filter on output of test equipment interference source
- Results again demonstrate harmful interference
 - Access failures and dropped calls in AWS-1 from AWS-3 interference
 - Consistent with prior tests performed by T-Mobile and observed by others
- Results also demonstrate that better AWS-1 receive filtering will not solve the problem
 - Tests performed on both high side and low side of AWS-1 band
 - On low side, AWS-1 handset receive filter rolls off at band edge
 - Tests show that harmful interference exists even with handset filter that rolls off at band edge
- Optimi's Monte Carlo accurate simulations demonstrated that AWS-3 interference would be a persistent and widespread problem for AWS-1
 - Around one-fifth of the sectors suffered capacity degradation worse than 10% due to AWS-3 interference
 - Users with an AWS-3 router inside their homes had a 67% chance of lost calls, and those with AWS-3 in neighbor homes had 28% chance of dropped calls when there was simultaneous AWS-3 transmission
- The AWS-3 band should be asymmetrically paired with the J Block uplink/downlink